

-continued

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1.-38. (canceled)

39. A method for detecting genomic mutations in a sample of a patient following an exposure to a DNA damaging agent, the method comprising:

- (a) providing a sample from the patient following the exposure, wherein the sample comprises a plurality of double-stranded DNA molecules;
- (b) ligating cypher polynucleotides to the double-stranded DNA molecules to form double-stranded cypher-target nucleic acid complexes, wherein the cypher polynucleotides comprise identifier tags selected from a plurality of distinct identifier tag sequences;

- (c) amplifying the cypher-target nucleic acid complexes to produce a plurality of cypher-target amplification products from first strands and distinct yet related complementary second strands of the cypher-target nucleic acid complexes;
- (d) sequencing the cypher-target amplification products to produce a plurality of first-strand sequencing reads and a plurality of second-strand sequencing reads;
- (e) mapping the plurality of first-strand sequencing reads and the plurality of second-strand sequencing reads to a reference sequence to identify sequences corresponding to the reference sequence; and